

R E M A R K S

The last Office Action has been carefully considered.

It is noted that the claims are rejected under 35 U.S.C. 102 and 103 over the patent to Caldwell.

Also, the claims are rejected under 35 U.S.C. 112.

In connection with the Examiner's rejection of the claims under 35 U.S.C. 112, applicant has amended the claims respectively in compliance with the Examiner's requirements. The term "the main grid portion" is utilized since the present invention as defined for example in claim 1 deals with a cellular X-ray grid which includes the grid itself and moving means, and therefore the grid itself has been identified as a main grid portion. As for the meaning of the lining, the lining is the element 4 in the drawings and it is believed that it is properly claimed in the respective claims. As for the end sides of claim 18, it is respectfully submitted that the main portion of the grid or basically the grid itself has a peripheral portion and two end sides which in the horizontal position of the grid is an upper side and a lower side. This is the meaning implied in claim 18. As for failure of

claims 14 and 18 to recite essential elements of the invention such as grid moving means, it is respectfully submitted that these claims deal with a cellular X-ray grid which is not necessarily movable. In compliance with the Examiner's requirements claim 15 has been cancelled as constituting new matter.

It is respectfully submitted that the independent claims currently on file clearly and patentably distinguish the present invention from the references.

It is believed that before the analysis of the individual claims currently on file, to be advisable to analyze the construction and the operation of the X-ray grid in accordance with the present invention as well as the construction and the operation of the X-ray grid in accordance with the reference applied by the Examiner against the claims.

The attached Figures A1 and A2 show a perspective view and a cross-section of an X-ray grid in accordance with the present invention, whereas figures B1 and B2 show a perspective view and a cross-section of the X-ray in accordance with the patent to Caldwell.

In accordance with the above discussed terminology the X-ray grid has a main grid portion and means for moving the main grid portion. The main grid portion in accordance with the present invention is a monolithic integral element composed of an X-ray transmitting material (photosensitive glass) with all surfaces covered with an X-ray absorbing material (electrostatic lead). In other words, the rigid supporting structure (photosensitive glass) of this element is located inside a soft coating (lead). The rigid supporting structure provides a necessary rigidity for the grid. Since the grid has the rigid supporting structure which ensures the rigidity, it is possible to make cells empty, or in other words it is not necessary to fill the cells with an additional material for supporting soft partitions (which cannot support themselves without a supporting structure). As can be seen from Fig. A2, the cells are empty and do not contain any supporting material, and a structure between two adjacent cells is formed as a multi-layer structure including one X-ray transmitting partition (composed for example of photosensitive glass), and two layers of an X-ray absorbing material (composed for example of lead).

Turning now to the X-ray grid disclosed in the patent to Caldwell, it can be seen that it has a peripheral frame as shown in Fig. B1 and a plurality of soft members

intersecting one another and connected with their ends to the frame. A structure between two adjacent cells is a single-layer structure and formed by one soft member (composed for example of lead). This construction is however insufficient for providing a rigid X-ray grid since the soft members with a thickness of approximately 0.5 - 1 mm cannot maintain the desired shape and size of the cells. For this reason the cells inside the soft members are filled with a filling material. (Caldwell, p. 4, lines 74-77, numeral 65) The filling material substantially affects the quality of an X-ray image obtained on an X-ray sensitive carrier since it absorbs the radiation passing through the material-filled cells.

Independent claim 16 defines an X-ray grid in which the main grid portion has a plurality of cells, a plurality of partitions separating the cells from one another and an X-absorbing layer covering all surfaces of the partitions. As mentioned hereinabove the Caldwell patent does not disclose in a space between the cells, the partitions and the X-ray absorbing layer covering the partitions. Thus, this claim should be considered as patentably distinguishing over the patent to Caldwell and should be allowed.

Claim 12 defines that all surfaces of the main portion are covered with an X-ray absorbing material. Claim 13

defines that the X-ray absorbing material covers also the lining which peripherally surrounds the main portion. Claim 17 depends on claim 16 and also defines that the X-ray absorbing layer covers the lining. These features are not disclosed in the patent to Caldwell and cannot be derived from it. Therefore, these claims should be considered as patentably distinguishing over the patent to Caldwell and should be allowed as well.

The X-ray grid in accordance with the present invention is a thin grid having a thickness of approximately 1 - 2 mm, a structure between two neighboring cells is 0.05-0.48 including the X-ray absorbing layer of 0.02 mm, and the transverse dimensions of the cells are 0.17 - 0.4 mm. As disclosed in the patent to Caldwell (page 2, lines 48 - 49), the thickness of its X-ray grid is 1/2 inch - 1 inch or in other words 12.75 - 25.5 mm and the transverse dimensions of the cell are equal to approximately 1/5th of the grid thickness which corresponds to 2.5 - 5 mm. Such a thick structure naturally does not need upper and lower covers. In contrast, in accordance with the applicant's invention, the thin grid needs upper and lower covers to improve its rigidity and stability, and the covers are composed of X-ray radiation transmitting material. These features are not disclosed in the patent to Caldwell, and, as explained hereinabove, in view of

the construction and size of the Caldwell grid cannot be considered as obvious from this reference in any way. Therefore claim 18, which defines the plates arranged at both end sides of the main portion and connected permanently to top and bottom surfaces of the partitions and the lining should be considered as patentably distinguishing over the patent to Caldwell as well.

In order to allow passage of a maximum quantity of useful information through the cell, the cell must be as X-ray transparent as possible. In accordance with the applicant's invention the cells are filled with ~~gas~~ or vacuum as defined correspondingly in claims 1 and 14. This is not just an alternative to the cells filled with an additional reinforcing and stabilizing material as in the patent to Caldwell. This structure of the cells of the present invention touches the critical aspect of the X-ray grid, namely its ~~property~~ to allow passage of an extremely important information for obtaining X-ray images on X-ray sensitive carriers. Therefore these features which are not disclosed in the patent to Caldwell should be considered as patentably distinguishing over this reference, and the above listed claims should be allowed.

Finally, an exceptionally ^{important} issue of erasing the image of the cells on an X-ray sensitive material is completely

solved in the applicant's invention. In accordance with the present invention, the sides of the cells are located relative to the side of the grid extending parallel to the direction of movement of the grid at such an angle as to erase an image of the cells on the X-ray sensitive material. This angle is disclosed in the specification as one of the Mattson angles. When the sides of the cells are arranged in this inventive way, each subsequent apex of each cell moves parallel and close to a preceding apex along the movement direction. As a result, a non-interrupted uniform background of strips located close to one another without gaps therebetween is produced. All portions of an X-ray sensitive material (X-ray film) are exposed identically and the image of the grid is completely erased. In the patent to Caldwell the patentee mentions many times the diagonal orientation of the cells, such as for example on page 1, line 23, page 2, line 28, claims 1 - 7, 12 - 14, etc. which is necessary during a parallel movement of the grid. With this construction of the cells apexes of all cells exactly follow each other along ^{the same} line which is a diagonal line and draw a white line of underexposed areas. The width of this line in the Caldwell grid is substantial: with the thickness of the lead members approximately $1/5$ of the transverse cross-section of the cell, the thickness of such a line corresponds to $2 \times 2 \times \text{thickness} = 2 \times 2 \times 0.5 = 1 \text{ mm}$ = 2 - 4 mm. Between the lines there are strips of normally

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exposed areas with the thickness equal to $1/2$ cell diagonal = $12.75^2/2$ or = 9-18 mm. As a result, over the whole X-ray film there would be a stripped structure with a white line 2 - 4 mm thickness without image and then black line 9 - 18 mm with ^{a part of} the image, repeated many times. If for example a patient has a broken bone with a thickness of 3 mm and length 200 mm, a medical practitioner will not see on an X-ray film anything at all since there would be no image of this injury. It should be mentioned that this injury is huge when compared with other more frequently occurring pathologies. The present invention eliminates the above mentioned disadvantages and provides an X-ray image in which the images of the cells are completely erased. It is therefore believed that the new features of the present invention defined now in claims 1 and 14 which define the X-ray grid formed with the sides of the celling point to raise the image of cells should be considered as patentably distinguishing over the patent to Caldwell as well and should be allowed.

Reconsideration and allowance of the application are most respectfully requested.

Should the Examiner require or consider it advisable that the specification, claims and/or drawings be further amended or corrected in formal respects in order to place this

case in condition for final allowance, then it is respectfully requested that such amendments or corrections be carried out by Examiner's Amendment, and the case be passed to issue. Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing this case to allowance, he is invited to telephone the undersigned (at 516-243-3818).

Respectfully submitted,


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